JOINT ORDNANCE COMMANDERS GROUP
DEMILITARIZATION INTEGRATION

By James Q. Wheeler

BACKGROUND

The JOCG is an organization of flag officers who "own and operate" the U.S. munitions base. There are 25 functional subgroups which report to the JOCG. The Munitions Demil/Disposal Subgroup is the largest and most active of the groups. Figure 1 indicates the mission statement of the subgroup which directly supports DOD's missions in the areas of demil policy development, execution, and research and development (R&D). This is done via linkage between the Military Services, the Defense Nuclear Agency (DNA), Department of Commerce (COMM), Department of Energy (DOE), Department of Interior (DOI), U.S. Environmental Protection Agency (EPA), and the National Aeronautics and Space Administration (NASA), along with academia and industry internationally.

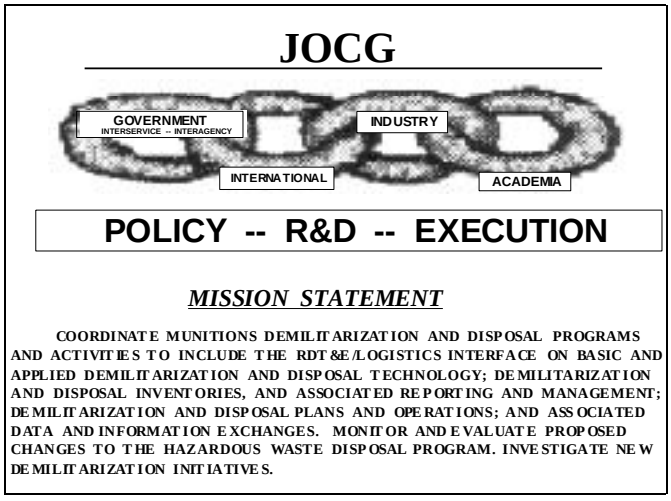

Figure 1

The subgroup provides joint coordination for funded programs, such as the Joint Service Large Rocket Motor Demil Program (JSLRMDP), the Joint DOD/DOE Munitions Technology Development (Technology Coordination Group IX (TCG IX)) Demil R&D Program, and the Munitions Items Disposition Action System (MIDAS) Program. Additionally, it has proposed the Joint Service Conventional Munitions Demil R&D program which, while it failed to receive funding in FY 95, has continued to serve as a vehicle for integrating individual efforts. It also supports the Single Manager for Conventional Ammunition (SMCA), Services, DOE and other demilitarization execution programs along with providing valuable environmental services. On-site treatment processes for Formerly Used Defense Sites (FUDS) has also been an area of focus. It holds regular working group meetings, and sponsors the semi-annual Demil Users Group Meetings and the annual JOCG/American Defense Preparedness Association (ADPA) Global Demil Symposium. These efforts assure communications within all levels of government, industry and academia internationally.

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BASELINE.

MIDAS. The MIDAS Program is a methodology used for stockpile analysis and directly impacts the other focus areas. The MIDAS Program is the bridge between R & D and the user community. The initial thrust is the identification and characterization of munitions items in support of resource recovery and recycling (R3) operations. Processes are being analyzed and requirements are being identified. In many cases, the best value may be established by providing execution planners and operators with the complete characterization of items and R3 technologies. Complete characterization methodology will help in identifying technology shortfalls. The program also supports the resolution of environmental issues and installation permitting issues. Other integral aspects of the MIDAS program include execution support and technical assistance. Execution support includes the Demil Users Group which meets semi-annually and is open to the demil community that is actively engaged in the performance of demil execution. Several focus groups have been established to concentrate on specific problems associated with demilitarization execution, such as, demil certification and updating demil regulations. Another benefit has been providing Resource Conservation and Recovery Act (RCRA) environmental permit writers information on the composition of material to be treated.

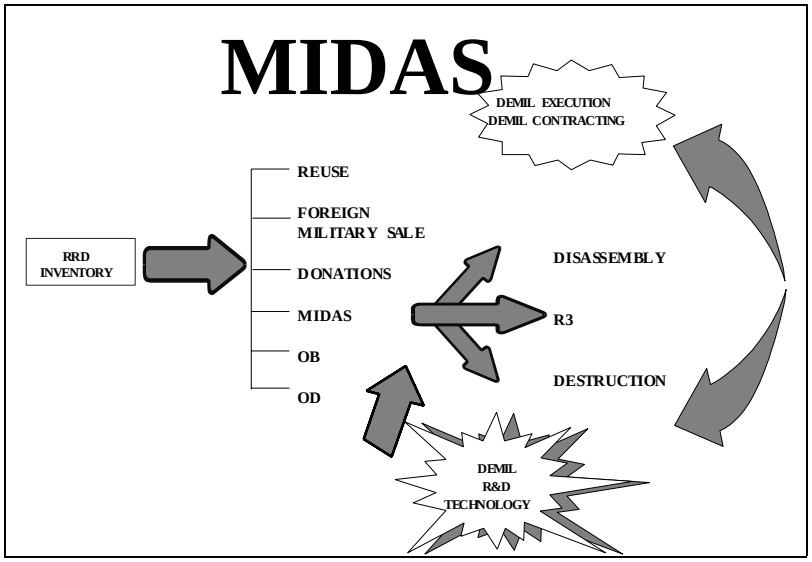

Figure 2

STOCKPILE ANALYSIS To address munitions demilitarization baseline, requirements exist to determine current and forecasted stocks, their propellant, explosives and pyrotechnic (PEP) fills and storage impacts. The RRD stockpile consists of excess, obsolete and unserviceable conventional ammunition, tactical rocket motors, large rocket motors (LRM) and attendant components and energetics. The stockpile has seen significant activity in recent years due to the reduction in global threat and the phasing out of weapons systems. The current stockpile requiring resource recovery or disposition is 449,308 tons. Forecasted generations through the Future Year Defense Plan (FYDP) period (FY 95 - Fiscal Year 2001) are 730,420 tons. Through the end of Fiscal Year 2001, over 1.2 million tons will pass through or reside in the account.

Using MIDAS methodology to characterize the stockpile, current and forecasted tonnages are broken out by family in Table 1.

Resource Recovery and Disposition Stockpile by MIDAS Family (31 March 1995)

MIDAS Family	MIDAS CODE	TOTALS	
		Current Tons	Forecast Tons
Small Caliber Ammunition	SA	11,289	82,867
Small Components	SC	8,772	3,475
Fuzes	SF	11,979	8,605
Bulk Propellant	PB	20,684	41,298
Propellant Charges	PC	34,260	60,827
Propellant Munitions/Components	PD	28,577	32,080
Small HE Components	HA	987	1,083
HE Bombs	HB	42,895	78,679
HE Cartridges	HC	52,685	76,113
High Explosive D Loaded	HD	32,436	4,643
Bulk High Explosives	HE	2,301	4,291
HE Grenades	HG	674	390
HE Depth Charges & UWM	HH	3,782	4,015
HE ICM/CBU Munitions	HI	52,325	116,758
Missiles	HM	2,542	24
HE Projectiles/Warheads	HP	25,688	119,290
HE Rockets	HR	7,578	1,004
Torpedoes	HT	362	288
Demolition Materials	HX	1,492	5,622
HE Land Mines	HZ	7,819	2,170
Incendiary/Thermite	FI	18,039	461
Pyrotechnics	FP	5,597	7,812
Munitions with Dye	CD	162	187
Smokes, WP/PWP	CP	6,719	8,785
Smokes, Riot Control	CR	8,072	5,541
Smokes, HC/Colored/RP	CS	4,184	4,979
Depleted Uranium	DU	12,309	6,033
Inert	I	24,137	25,021
No Family	N	10,600	14,978
Tactical Missiles	TM	8,563	3,627
Large Rocket Motors	LR	1,799	9,474
TOTAL TONS		449,308	730,420

Table 1

Based on Service/Agency data, current and forecasted stocks are shown by their macro-level families in Table 2. As the Single Manager for Conventional Ammunition (SMCA), the Army controls and generates the majority of conventional ammunition tonnage.

Current and Forecasted RRD Stockpile Tons by Service / Agency (31 March 1995)

Service/ Agency	Status	Conventional Ammunition	Tactical Missile	LRM	Total
Army	Current	407,810	7,511	0	415,321
	Forecast	346,205	2,652	0	348,857
Air Force	Current	9,196	223	1,062	10,481
	Forecast	192,000	53	5,080	197,133
Marine Corps	Current	1,119	0	0	1,119
	Forecast	98,996	0	0	98,996
Navy	Current	20,680	97	727	21,504
	Forecast	79,877	922	2,147	82,946
DOE	Current	141	732	0	873
	Forecast	241	0	0	241
NASA	Current	0	0	10	10
	Forecast	0	0	2,247	2,247
CURRENT TOTAL		**438,946**	**8,563**	**1,799**	**449,308**
FORECASTED TOTAL		**717,319**	**3,627**	**9,474**	**730,420**

Table 2

The RRD stockpile may be further subdivided by MIDAS family/missile system, current and forecasted tonnage, and owning/generating Service or Agency.

The Navy and Air Force manage the majority of the LRM stockpile. Other LRM material not captured in this paper are production rejects and excess energetic scrap. Propellant, explosives and pyrotechnics (PEP) in the current and forecasted stockpile (Table 3) can also be quantified and are based on the most accurate data available. While the forecasted totals are clearly extremely conservative, the aggregate total is still nearly 290 million pounds.

Estimation of PEP (lbs in millions) in Existing and Forecasted Inventories (31 March 95)

Type of PEP (Propellant, Explosives & Pyrotechnics)	Current Lbs	Forecasted Lbs	Total Lbs
Single Base Propellant	57,863,403	20,558,622	78,422,025
Double Base Propellant	5,396,279	5,956,896	11,353,175
Triple Base Propellant	7,788,940	20,106,326	27,895,266
Tactical Missile Propellant	4,127,226	1,072,833	5,200,059
Liquid Propellant	904,536	0	904,536
LRM Propellant	3,398,930	18,319,678	21,718,608
PROPELLANT TOTAL	**79,479,314**	**66,014,355**	**145,493,669**
Composition A	5,186,892	299,115	5,486,007
Composition B	8,916,556	102,126	9,018,682
Composition C	4,426	45,370	49,796
Composition D	355,502	0	355,502
Explosive D	3,243,600	464,300	3,707,900
H-6	1,914,250	0	1,914,250
HBX	21,700	0	21,700
HMX	2,253	0	2,253
PBX	27,546	0	27,546
TNT	8,404,414	54,392	8,458,806
Tritonal	44,464,200	58,461,700	102,925,900
Tetryl	15,840	0	15,840
RDX	20,971	1,989	22,960
EXPLOSIVES TOTAL	**72,578,150**	**59,428,992**	**132,007,142**
Riot Control	4,694,182	151,942	4,846,124
White Phosphorus	1,917,583	179,400	2,096,983
Smoke (Colored, HC, & RP)	2,265,715	89,110	2,354,825
Illuminant Composition	1,025,586	176,544	1,202,130
NONSURETY CHEMICAL TOTAL	**9,903,066**	**596,996**	**10,500,062**

Table 3

In addition to the volume of items and configurations, the stocks are also stored throughout the world. Figure 3 shows stocks in 27 States, Europe and the Pacific.

If aggregated, these stocks in the current inventory would fill our largest storage facility, exceeding 2,800 earth covered magazines and costing nearly $12M annually to store as noted in Figure 4.

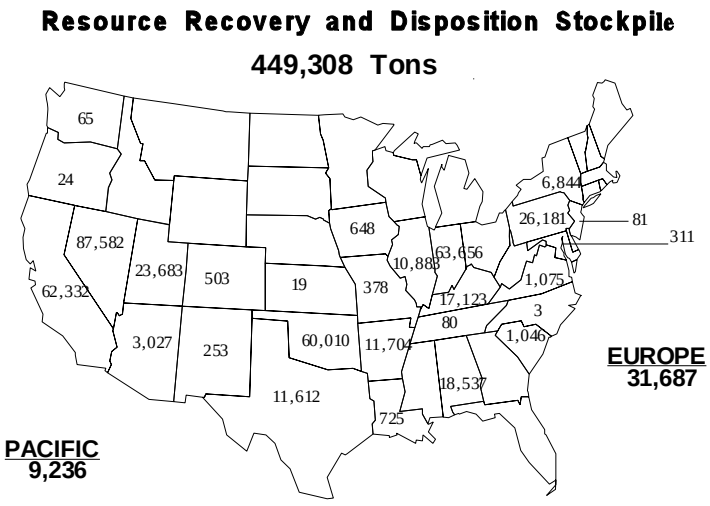

Figure 3

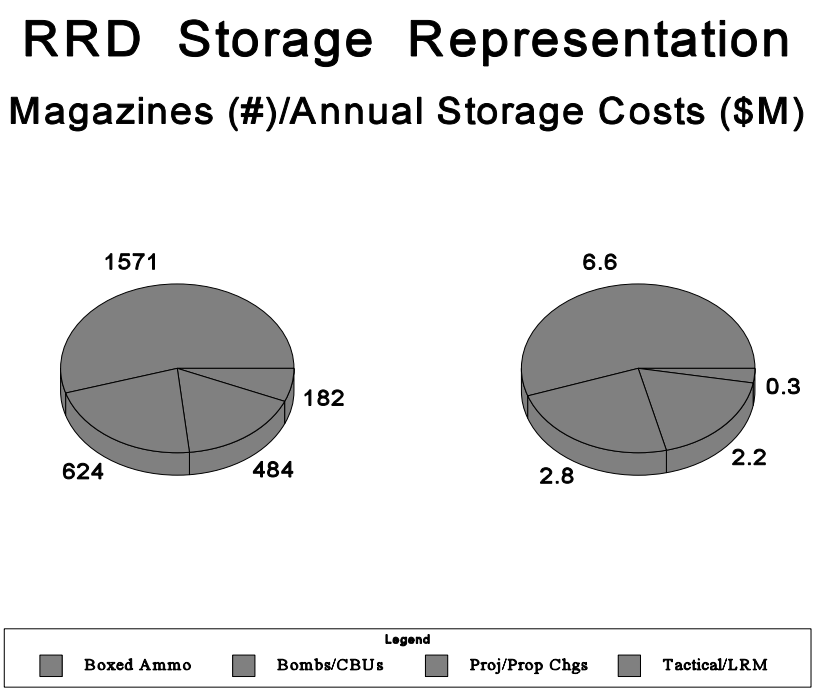

Figure 4

The numbers, configurations, PEP quantity and storage impacts along with the geographic dispersion clearly indicate the potential value and challenge of this stockpile.

TECHNOLOGY. Demilitarization technology options available to the demil community either underway or proposed have been baselined. Drivers for technology development include the size and diversity of munitions items, the geographic dispersion of the stocks, and the simple need to provide the demil user with modern capability. Many other challenges related to environmental and strategic issues also establish the need for a coordinated development effort focused on resource recovery and disposition. Historically, standard techniques of removal, disassembly, incineration or open burning/open detonation (OB/OD) were viewed as both safe and efficient. As environmental awareness increased and potential health and safety risks became known, the requirement for

DEMILITARIZATION TECHNOLOGY R & D REQUIREMENTS

TECHNOLOGY	MUNITIONS AFFECTED
HAZARD SEPARATION SYSTEM	FUZES, FIRING SETS, ELECTRONIC PARTS
CO2 REMOVAL PROCESS FOR PRESS LOADED EXPLOSIVE	COMP A, EXPLOSIVE D, PBX LOADED PROJECTILES
ADVANCED ENERGETIC REMOVAL TECHNOLOGY	CAST LOADED MUNITIONS
CRYOCYCLING	BULK ENERGETICS, MISSILES, ROCKETS, LRM
REMOVAL OF HIGH COST EXPLOSIVE FROM MUNITIONS PROTOTYPE	PROTOTYPE MUNITIONS
EXPLOSIVE REWORK PROCESS FOR CAST LOADED MUNITIONS	60 MM MOTORS TO 8 INCH PROJECTILES
ON-SITE ANALYSIS OF STABILIZER CONTENT IN PROPELLANT	MUNITIONS WITH PROPELLANT
RECOVERY / REUSE OF NAVY GUN PROPELLANTS	SINGLE / DOUBLE / TRIPLE BASE PROPELLANTS
HMX / RDX RECOVERY	CLASS 1.1 PROPELLANTS, PBX LOADED PROJECTILES
CHEMICAL CONVERSION OF CS VIA HYDROLYSIS	BULK CS AND MUNITIONS WITH CS
COFIRING ENERGETIC MATERIALS DERIVED FUELS	BULK ENERGETICS AND RESIDUES
DEMIL OF REACTIVE MATERIAL MUNITIONS	REACTIVE MATERIAL MUNITIONS
SEPARATION TECHNOLOGY FOR RECOVERY OF EXPLOSIVE COMPONENTS	HE BOMBS / MUNITIONS
RECYCLING OF DU AND HEAVY METAL ALLOY WARHEADS	DU AND HEAVY METAL ALLOY WARHEADS
METAL BONDING	COMP A AND PBX WARHEAD/PROJECTILES
COMMERCIAL MINING EXPLOSIVES	EXPLOSIVES AND PROPELLANTS
EXPLOSIVE D CONVERSION	EXPLOSIVE D LOADED MUNITIONS
SUPERCRITICAL WATER OXIDATION OF SMOKES AND DYES	COLORED SMOKES AND DYES
PLASMA ARC THERMAL TREATMENT	PYROTECHNIC ORDNANCE, ENERGETICS, FUZES
CRYOFRACTURE	ICM, MUNITIONS, GRENADES, MINES
MOLTEN SALT TECHNOLOGY	SMALL MUNITIONS AND PYROTECHNICS
FORGE HAMMER DECLASSIFICATION / DEMILITARIZATION	FUZES, ELECTRONIC PARTS
MOLTEN METAL OXIDATION	BULK ENERGETIC MATERIALS
PYROTECHNIC INCINERATION	PYROTECHNIC MUNITIONS
CHARGED PARTICLE BEAM FOR DETECTION/DESTRUCTION OF EXPLOSIVE	BULK HE, WARHEAD, BOMBS, PROJECTILES
REAL TIME METAL EMISSION MONITORING	INCINERATABLE MUNITIONS
CHEMICAL AND BIOLOGICAL SYSTEM FOR ACTIVATED CARBONCONTAMINATED W / HE	HE CONTAMINATED ACTIVATED CARBON
NON-THERMAL DISCHARGE DESTRUCTION OF OFF-GASSES	GASEOUS EFFLUENTS

Table 4

alternative destruction technologies and enhanced resource recovery processes began to emerge. However, there are no clear paths for research and development sponsorship since much of the requirement is generated by items long out of their acquisition cycle. Some programs such as the JOCG JSLRMDP and the Joint DOD/DOE Munitions Technology Development Program have found support and are delivering demonstrated processes. Technology reviews are ongoing with proposed projects and are focused on specific areas in the stockpile. Table 4 identifies a broad range of technology applications that are being pursued with the munitions affected.

The thrust areas identified are disassembly, removal, recovery/reuse, destruction and waste stream treatment.

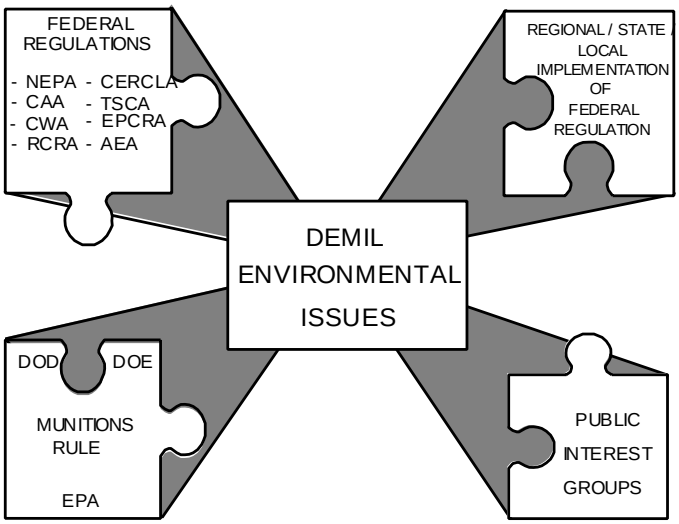

Figure 5

ENVIRONMENTAL

Figure 5 depicts the environmental issues that challenge the demil program today. While there are few regulations that directly impact demil, a wide range of environmental regulations apply to waste disposal and management. Demilitarization Integration must address the environmental guidance and will have significant impact on demil, to include the National Environmental Policy Act (NEPA), the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA) and the Clean Water Act (CWA). Currently, facility operations are subject to local, state and Federal regulators' interpretation of environmental requirements. At Federal regional level, stocks are currently under purview of nine of the ten regions shown in Figure 6. Therefore, the demil community must be cognizant of not only Federal regulation, but must also comply with regional, state and local interpretation of those regulations. Of particular concern is the "Munitions Rule" which will determine when a munition becomes a hazardous waste. The demil community is currently waiting for the final EPA determination on this rule which again, will be subject to State/Region

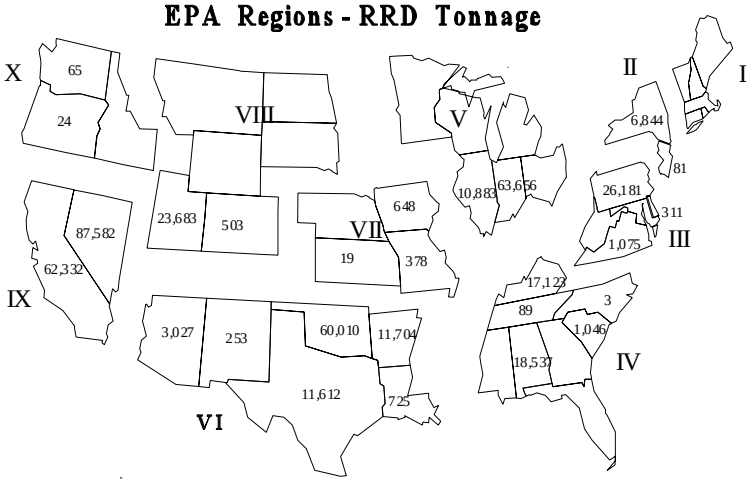

Figure 6

interpretation. Another consideration for the demil community are the efforts of public interest groups such as the Uncertain (TX) Audubon Society or the Safe Water Around Badger (AAP). While these groups do not dictate law directly, they certainly have legitimate concerns that impact environmental rulings and must be recognized. Demil has historically been accomplished in accordance with prevailing standards. In the not too distance past, land burial, ocean dumping and uncontrolled incineration were accepted practices. As more was learned, these practices were modified or prohibited. As more is learned today and issues are resolved, opportunities in the future demilitarization programs will be clarified.

CONCLUSION

The Demilitarization Baseline establishes the current level of the assets requiring resource recovery and disposition at 449,308 tons, with a forecast of an additional 730,420 tons through the end of Fiscal Year 2001. During FY 86-94, tonnage reported as accomplished was 441,299 with 107,019 tons planned for FY 95. Currently, it is estimated that nearly $12 million are expended annually on storage of these items covering an approximate 4.1 million square feet. Costs vary greatly due to diversity of munitions configuration, locale, and execution strategy. In addition to storage costs, demil stocks also have an adverse impact on readiness by occupying storage space which could be better used to optimize storage of operational stocks. In the longer term, demil stocks represent a potential degradation of safety, and will always be a security consideration.

The FY 95 cost per ton for conventional ammunition demil ranges from a proposed $95/ton to about $4,000/ton. The FY 95-96 demil programs are supported at the $100 million level, but in Fiscal Years 1997-2001 levels drop to approximately $50 million. That level will seriously reduce accomplishments and delay or terminate initiatives.

The requirement to develop safe, efficient, environmentally acceptable technologies has been recognized by the demil community (i.e., government, industry, academia). However, just as with execution, the technology development funding levels are constantly changing. Stabilization of development versus munitions requirements, environmental requirements, and economic reality is being achieved. Transition of new processes into both the government and commercial base remains challenging, but processes, such as white and red phosphorus reclamation, applications of military energetics to commercial mining and blasting and others have successfully moved from development into both the government and commercial demil base.

Resolving environmental concerns remains critical to focusing the execution and development programs. Answers to such questions as, when does a munition become a hazardous waste and are recovered energetics hazardous material or hazardous waste, are being aggressively pursued.

This demil baseline documents the numerous ongoing and planned demil initiatives to meet the following challenges: the reality of a growing stockpile requiring resource recovery and disposition, the uncertainty of resource levels for demil execution, demil technology development, technology transition, transfer, implementation, and the evolving nature of environmental guidance.